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Docket No.: 249210US0

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

RE: Application Serial No.: 10/790,019
Applicants: Tatsuya YASUNAGA, et al.
Filing Date: March 2, 2004
For: RUBBER BONDED BRASS COMPOSITE MATERIAL
Group Art Unit: 1733
Examiner: FISCHER, J.R.

SIR:

Attached hereto for filing are the following papers:

Appeal Brief

Our credit card payment form in the amount of **$500.00** is attached covering any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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DOCKET NO: 249210US0

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:	
TATSUYA YASUNAGA, ET AL.	:	EXAMINER: FISCHER, JUSTIN R.
SERIAL NO: 10/790,019	:	
FILED: MARCH 2, 2004	:	GROUP ART UNIT: 1733
FOR: RUBBER BONDED BRASS COMPOSITE MATERIAL	:	

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated September 11, 2006. A Notice of Appeal was timely filed on February 9, 2007.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Kabushiki Kaisha Kobe Seiko Sho (Kobe Steel, Ltd.), having an address at 10-26, Wakinohama-cho 2-chome, Chuo-ku, Kobe-shi, Hyogo, Japan 651-8585.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1 and 3-10 stand rejected and are herein appealed. Claim 2 has been canceled.

IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed, although a request for reconsideration after Final was filed..

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent Claim 1 is drawn to a composite material prepared by bonding rubber to the surface of a brass-plated material obtained by plating the surface of a substrate with brass or to the surface of a brass material by vulcanization,

wherein needle-like Cu-S-based reaction products are formed at the bonding interface between brass and rubber,

wherein preheating is carried out at 80 to 120°C before vulcanization,

wherein when the section of the bonding interface between brass and rubber is observed through a transmission electron microscope, 1 to 50 needle-like Cu-S-based reaction products having a length L of 10 nm or more and a ratio of the length L to the width W (L/W) of 5 or more are existent based on 1 μm in the length of the section of the bonding interface.

See original Claims 1 and 2, and the specification at page 5, last full paragraph, and the succeeding paragraph.

VI. GROUNDS OF REJECTION

Claims 1 and 3-10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over JP 200209643 (Takayama) and further in view of US 6,974,654 (Heishi), US 4,446,198 (Shemenski), and the Rubber Technology and Manufacture article (RTM).

VII. ARGUMENT

Claims 1 and 3-10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Takayama and further in view of Heishi, Shemenski, and RTM. That rejection is untenable and should not be sustained.

As recited in Claim 1, the invention is drawn to a composite material prepared by bonding rubber to the surface of a brass-plated material obtained by plating the surface of a substrate with brass or to the surface of a brass material by vulcanization, wherein needle-like Cu-S-based reaction products are formed at the bonding interface between brass and rubber, wherein preheating is carried out at 80 to 120°C before vulcanization, wherein when the section of the bonding interface between brass and rubber is observed through a transmission electron microscope, 1 to 50 needle-like Cu-S-based reaction products having a length L of 10 nm or more and a ratio of the length L to the width W (L/W) of 5 or more are existent based on 1 μm in the length of the section of the bonding interface.

As described in the specification at the first full paragraph under "Detailed Description of the Preferred Embodiment," at page 5, Applicants discovered that adhesion of brass to rubber can be improved due to the existence of needle-like Cu-S-based reaction products formed at the interface between brass plating and rubber after vulcanization which is carried out after a pre-heating step is carried out on an unvulcanized green tire at 80 to 120°C. In addition, and as described in the specification at page 6, first and second full paragraphs, only such needle-like reaction products having particular dimensions contribute to adhesion;

similar reaction products of different size do not. Thus, Fig. 1A shows sizes that do contribute to adhesion to rubber; Figs. 1B and 1C show sizes that do not contribute to adhesion to rubber.

In addition, while preheating temperature is a necessary condition to form the desired Cu-S-based reaction products, it is not a sufficient condition. As described in the specification at page 8, lines 4-5, optimum conditions change according to the components and composition of a rubber compound. Thus, preheating time is a factor also. Indeed, as shown in Fig. 3 herein, 10 minutes of preheating at 100°C, followed by vulcanization at 160°C for 15 minutes, resulted in excellent adhesion to rubber, as described in the specification at page 8, first full paragraph. On the other hand, under the same conditions, except for preheating for 20 minutes, and as shown in Fig. 4, inferior results are obtained, as described in the specification at the paragraph bridging pages 8 and 9. Data for the conditions discussed above with regard to Figs. 3 and 4 appear in Table 1 for sample Nos. 6 and 11, respectively, which Table 1 is reproduced below. In all of the examples shown in Table 1, preheating, when carried out, was at 100°C, as described in the specification at page 11, second paragraph.

TABLE 1

No.	Preheating time (min)	Number of needle-like Cu—S-based reaction products based on 1 μm in the length of the bonding interface	Initial adhesion	Long-term adhesion
1	0 (Not preheated)	None	100	100
2	2	0.2	101	103
3	4	1.2	120	122
4	6	2.1	131	130
5	8	3.5	142	141
6	10	5.2	150	150
7	12	15.5	153	151
8	14	22.5	140	142
9	16	32.2	133	131
10	18	45.5	121	120
11	20	53.2	101	99
12	22	64.5	98	100
13	24	72.2	97	98
14	26	80.5	98	99

The specification describes the above-results, at page 12, lines 1-9 below Table 1, and page 13, lines 1-5, as follows:

> A composite material having **1 to 50 needle-like Cu-S-based reaction products** (based on 1 μm in the length of the interface) has a **bonding strength of 120% or more**, a composite material having 2 to 40 needle-like Cu-S-based reaction products has a bonding strength of 130% or more, and a composite material having 3 to 30 needle-like Cu-S-based reaction products has a bonding strength of 140% or more. Therefore, it can be understood that they have **excellent adhesion to rubber**.
>
> In contrast to these, a composite material having **less than 1 needle-like Cu-S-based reaction product** (No. 2) and a composite material having **more than 50 needle-like Cu-S-based reaction products** (Nos. 11 to 14) have the same or **lower bonding strength** than a composite material obtained without preheating.

(Emphasis added).

Thus, the present invention is not simply a recognition that needle-like Cu-S-based reaction products are obtained when preheating is carried out within the temperature range recited in the claims, but that other factors, such as the time of preheating, affects the size and

number of such reaction products, and that adhesion is promoted only when reaction products having a particular size and a particular number are obtained.

One skilled in the art would have been without a clue of Applicants' discovery when considering the applied prior art, as now discussed.

Takayama discloses that overall curing time of a tire is reduced if the green tire is preheated before vulcanization, resulting in improved uniformity and quality of the tire. Applicants acknowledge that Takayama discloses the presence of a metal wire inside the unvulcanized tire, as pointed out by the Examiner. However, the purpose of the metal wire appears to be as the means which receives electromagnetic induction so as to heat the wire to a temperature of 80-120°C ([0014] and [0018]), so as to heat the tire. There is no disclosure or any recognition in Takayama that one effect of the preheating is to increase the adhesion between the metal wire and the rubber of the tire.

The Examiner relies on Heishi, Shemenski, and RTM for their respective disclosures that brass plating of tire cords is conventional. The Examiner then holds that it would have been obvious to brass plate the metal wire of Takayama.

In reply, since the purpose of the wire in Takayama appears to be as a conductor of heat, it is not clear why one skilled in the art would coat the wire with brass. Nevertheless, even if it were obvious to so coat the wire, the result would still not be the presently-claimed invention, since Takayama does not recognize that conditions associated with preheating, as well as the preheating *per se*, are result-effective variables in terms of increasing adhesion between rubber and brass. Thus, the present claims are patentable under the rationale of *In re Antonie*, 559 F.2d 618, 195 USPQ 6, 8-9 (CCPA 1977) (exceptions to rule that optimization of a result-effective variable is obvious, such as where the results of optimizing the variable are unexpectedly good or where the variable was not recognized to be result effective). Applicants are entitled to prevail under either of the above exceptions.

In the Response to Arguments, beginning at page 4 of the Final Rejection, the Examiner finds that the presently-recited needle-like reaction products "appear to naturally result" from preheating a brass coated metal wire at 80-120°C.

In reply, and as discussed above, preheating within that temperature range is a necessary, but not a sufficient, condition. Moreover, while there is precedent supporting the notion, as cited by the Examiner, that the recognition of another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious, that is not the present case, since the present invention is more than simply following suggestions of the prior art.

The Examiner finds in the Final Rejection that the results in above-discussed Table 1 "suggest that an assembly preheated for 20 minutes is substantially the same as an assembly preheated up to 26 minutes (long term adhesion is actually the same or better at 2 of the 3 experimental times)."

In reply, the Examiner's finding actually makes Applicants' point. Both sample No. 11, which had a preheating time of 20 minutes, and sample No. 14, which had a preheating time of 26 minutes, are both outside the terms of the present claims, because the number of needle-like Cu-S based reaction products of required size are above the presently-recited maximum of 50.

Finally, the Examiner finds in the Final Rejection that "it is art recognized that bonding between brass coated reinforcing elements and rubber reaches a maximum during heating or vulcanization and additional heating actually degrades the bond," relying on Shemenski et al (column 1, lines 30-45).

In reply, the disclosure relied on by the Examiner is with regard to vulcanization, not preheating. It is thus irrelevant.

In the Advisory Action, the Examiner notes the disclosure in Takayama that by carrying out preheating, conventional vulcanizing time can be shortened by 10-20% ([0021]), and combines this disclosure with the finding that common vulcanization times are, for example, 30 minutes, to conclude that one of ordinary skill in the art "would not have expected the preheating time to be extremely long." The Examiner then notes that above-discussed Table 1 herein "suggests that the claimed amount of reaction products is formed by preheating for approximately 20 minutes or less," and then concludes that "[g]iven the standard vulcanization times, one of ordinary skill in the art at the time of the invention would have expected the preheating time to be significantly less than the vulcanization time (24-27 minutes in light of Takayama) and thus, less than 20 minutes."

In reply, even if the Examiner were correct that 30 minutes is a common or standard vulcanization time, and that preheating according to Takayama would permit a vulcanization time of 24-27 minutes, it does not follow that the preheating time in Takayama would necessarily be less than 20 minutes. Indeed, Takayama does not disclose **any** preheating times, and a time greater than 20 minutes or a time less than two minutes could also be within the terms of Takayama's preheating. Nevertheless, the present invention is not drawn to particular heating times *per se*, but rather to the discovery that the number of needle-like Cu-S-based reaction products is the result of both the preheating temperature and the preheating time, and affects bonding strength between brass and rubber.

In the Advisory Action, in response to Applicants' argument that it is not clear why one skilled in the art would coat the wires of Takayama with brass, the Examiner simply states that it is extremely well known in the tire industry to coat tire reinforcing elements with brass in order to improve the bond between rubber and steel cord. The Examiner further finds that "brass is an extremely good conductor of heat and it does not appear that plating the reinforcing wires of Takayama with brass would hinder their function."

In reply, Applicants do not dispute that what the Examiner states is well known is indeed well known. However, unless the purpose of the wire in Takayama is for purposes of reinforcing a tire, there would have been no reason to plate it with brass.

Claim 5

Claim 5 is separately patentable, since when the number of needle-like Cu-S-based reaction products is 2 to 40, the bonding strength of 130% or more, as discussed above.

Claim 6

Claim 6 is separately patentable, since when the number of needle-like Cu-S-based reaction products is 3 to 30, the bonding strength of 140% or more, as discussed above.

Claim 10

Claim 10 is separately patentable, since the applied prior art does not recognize the significance of preheating time before vulcanization, let alone a preheating time of from 2 to less than 20 minutes.

For all the above reasons, it is respectfully requested that the rejection be REVERSED.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that all the rejections still pending in the Final Office Action be REVERSED.

Respectfully submitted,

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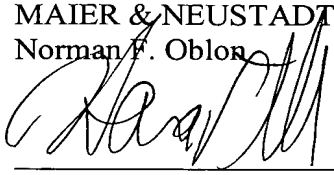

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CLAIMS APPENDIX

Claim 1: A composite material prepared by bonding rubber to the surface of a brass-plated material obtained by plating the surface of a substrate with brass or to the surface of a brass material by vulcanization,

wherein needle-like Cu-S-based reaction products are formed at the bonding interface between brass and rubber,

wherein preheating is carried out at 80 to 120°C before vulcanization,

wherein when the section of the bonding interface between brass and rubber is observed through a transmission electron microscope, 1 to 50 needle-like Cu-S-based reaction products having a length L of 10 nm or more and a ratio of the length L to the width W (L/W) of 5 or more are existent based on 1 μm in the length of the section of the bonding interface.

Claim 3: The rubber-bonded brass composite material according to claim 1, wherein the brass-plated material or brass material is a steel cord or bead wire for tires.

Claim 4: The rubber-bonded brass composite material according to claim 3, wherein the composite material is a tire.

Claim 5: The rubber-bonded brass composite material according to claim 1, wherein the number of needle-like Cu-S-based reaction products is 2 to 40.

Claim 6: The rubber-bonded brass composite material according to claim 1, wherein the number of needle-like Cu-S-based reaction products is 3 to 30.

Claim 7: The rubber-bonded brass composite material according to claim 1, wherein the preheating temperature is 90 to 110°C.

Claim 8: The rubber-bonded brass composite material according to claim 1, wherein the brass-plated material has a copper content of 50 to 90 wt % and a zinc content of 50 to 10 wt %.

Claim 9: The rubber-bonded brass composite material according to claim 3, wherein the steel cord has a copper content of 60 to 70 wt % and a zinc content of 40 to 30 wt %.

Claim 10: The rubber-bonded brass composite material according to claim 1, wherein a preheating time before vulcanization ranges from 2 to less than 20 minutes.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.